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# Effect Of An E-learning Program On The Quality Of life Of Patients With Coronary Heart Disease

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**Abstract**

This study aim was to assess the effect of an E-learning program on the quality of life (QoL) of patients with coronary heart disease. A quasi-experimental design was applied to 65 intervention patients and 61 control patients with recently diagnosed CHD in Palestine, at Jenin Hospital. An E-learning program was designed by the researchers and implemented for patients in the intervention group. The effect of utilization of the E-learning program was evaluated through a post-test assessment. The results revealed that the intervention group patients had better QoL related to physical function and bodily pain at the post-intervention phase. At the follow-up phase, their QoL was higher in almost all domains compared to control group.



*Keywords:* Coronary Heart Disease; Quality of Life; E-Learning.

## 1. Introduction

Worldwide, heart disease is considered as a leading cause of death, and constitutes a major part of expenditure on health ( Abdulle, Nagelkerke, Abouchacra & Obineche, 2008; Lloyd-Jones, Adams & Brown, 2010). The risk of developing coronary heart disease (CHD) depends on several determinants;

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some are associated with lifestyle operating from early childhood on (Assmann, Cullen & Schulte, 2002 ).

QoL measure is well suited for patients with CHD because many interventions are directed toward improving quality of life rather than just extending survival( Dougherty, 1998). One of the major goals to consider of cardiac rehabilitation is the changes in quality of life.( Shephard & Franklin, 2001; Muller-Nordhorn , 2004). Coronary artery bypass graft patients experience an average improvement in health related quality of life (HRQoL) after surgery(Lie et al., 2010) .Exercise-based cardiac rehabilitation studies revealed significantly fewer cardiac events and hospital readmissions, reduced total mortality and increased HRQoL ( Thompson et al., 2003).

Patient education is one of the most important strategies in prevention, control CVD.( Farahani, 2008). Cardiac patient education is an essential component of nursing care aimed at assisting those patients to take care of themselves(Fredericks, Beanlands, Spalding & Da Silva, 2010) .Nurses have a public health role to advise, help and support patients to make lifestyle changes. Nurses are able to provide expert advice and support in either a consultation or rehabilitation setting using a holistic approach to care. Smoking cessation, relaxation techniques and stress management can be undertaken with the patient and his/her carers in a relaxed, informal way ( Riley, 2003;Coster & Norman, 2009).

With the advent of E-Learning, new paradigms for teaching and learning about complex issues are emerging. A wide range of opportunities are being developed and implemented in the vocational, academic, and continuing education and training arenas to support life-long learning.( Thompson & Randall 2001; Wheeler, Byrne &Andrea, 2003; Britt, 2004 ).Self-management interventions in patients with CHD showed a positive effect, although not always significant, on the reduction of numbers of hospitalization, decrease in mortality and increasing Quality of Life. (Ditewiga, Bloka, Haversa & van Veenendaal, 2010; Yu, Thompson & Lee, 2006).The political situation in the Palestinian territories may make the continuity of care for chronic diseases a real problem. The use of the internet as a new technology for education of those patients and for keeping continuing contact with them and responding to their queries might help them in management and prevention of further complications. Therefore, this study is testing the effectiveness of E-learning for coronary heart disease patients (CHD) education.

### *1.2 Aim of the study*

The aim of this study was to assess the effect of an E-learning program on the quality of life of patients with CHD and on their compliance to medication. It was hypothesized that CHD patients exposed to the E-learning program will have more positive quality of life indices compared to coronary heart disease patients on standard management.

## 2. Subjects and Methods

This quasi-experimental intervention study involved comparisons of a study and a control group, with pre-post assessment. It was conducted on CHD admitted to Jenin Hospital in Palestine. The inclusion criteria were being 18 years or older with recently diagnosed CHD , and having basic computer skills (either the patient or a family member).Patients with other chronic diseases as hyperthyroidism, nephrotic syndrome, liver disease, diabetes, and mental problems were excluded. The sample size was calculated to estimate a difference between the mean±SD score of QOL of patients in the control group ($X_1$=50.0±10.0) and the expected mean in the intervention group after the intervention ($X_2$=75.0±10.0), with a 95% level of confidence($\alpha$ error = 5%), and a study power of 80% (β error=10%). Using the equation for the difference between two means ( Schlesselman, 1982) the required sample size was 63 subjects per group. After adjustment for a dropout rate of 5%, the sample size would be 67 patients per group. A consecutive sampling technique was used to recruit patients. Those fulfilling the inclusion and exclusion criteria were randomly assigned to either the intervention or the control groups.

An interview questionnaire form was developed by the researcher .The tool involved a section for the socio-demographic data, medical history, and lifestyle habits. The Chinese version of SF-36 Health Survey (Liu, 2001) was used as a measurement tool for QoL of patients in this study. It was translated into Arabic using the translation-re-translation process to guarantee its original validity. The tool examines eight QoL domains, namely physical function, role physical, role emotion, social functioning, bodily pain, mental health, vitality, and general health. The reliability of the eight subscales has been estimated using both internal consistency and test-retest methods with high reliability statistics.(Failde, Ramos & Fernandez-Palacin, 2000; Kiebzak,2002;MaKee,2009). For scoring, the raw scores obtained on each SF-36 domain are transformed to a 0 to 100 scale, with higher scores indicating higher levels of QoL.The tool was pilot-tested and finalized. The reliability of the QOL scale turned to be high with Cronbach alpha coefficient 0.87.

After finalization of the study tools, recruitment of the patients was started in August 2009. The nature of the program was explained to each patient. Patients were assigned to either the intervention or the control group. Based on the analysis of the data obtained from the assessment, the researcher was able to identify the information needs of the patients. The E-learning program was then designed to fulfill these needs. The site uniform address locator is itc.birzeit.edu.

Patients in the intervention group were individually met by the researcher before discharge. The researcher explained to each patient the aim of the study .This was followed by a demonstration of the program site which included instructions on its use. The instructional booklet was then handed to them to help in proper utilization of the program. Patients were encouraged to enter the site through a specific user name and password. Also they were encouraged to post any questions to the researcher regarding their health condition for follow-up through the site Blog. For the first three months, the number of hits was 1298, and in the follow-up phase (3 months), the number of hits increased to 1667. This indicates that the patients trusted the information on the site as well as they needed continuous care and encouragement outside the hospital. Patients in the control group received the standard care provided at the hospital. The effect of utilization of the E-learning program was evaluated through a post-test assessment using the same pre-test tools. This was done after 3 and 6 months of the E-learning program implementation.

### *2.1 Ethical Considerations*

Before launching the study, ethical approval was obtained from the Scientific Research Ethics Committee of Ain Shams University. In addition, a written informed consent was obtained from each participant. Patients sharing in the study were reassured about the anonymity and confidentiality of any obtained information. They were also informed about their right to withdraw from the study at any time.

### *2.2 Statistical analysis*

Data entry and statistical analysis were done using SPSS 14.0 statistical software package. Quantitative continuous data were compared using Student t-test in case of comparisons between two groups and ANOVA for more than two groups. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. Statistical significance was considered at p-value $<0.05$.

## 3. Results

Only two patients (3.0%) in the study group and five (7.5%) in the control group did not continue the study. Table 1 shows that patients in the study and control groups had almost the same mean age (55.3±5.2 and 56.1±5.6, respectively). The study group had more males (87.7%) and less unmarried (3.1%) patients and these were the only differences of statistical significance between the two groups. Meanwhile, the two groups had similar residence, education, job status, and computer skills.

Table 1. Socio-demographic characteristics of patients in the study and control groups

| | Group | | | | $X^2$ Test | p-value |
|---|---|---|---|---|---|---|
| | Study (n=65) | | Control (n=61) | | | |
| | No. | % | No. | % | | |
| Age (years): | | | | | | |
| <60 | 50 | 76.9 | 42 | 68.9 | | |
| 60+ | 15 | 23.1 | 19 | 31.1 | | |
| Range | 46.0-65.0 | | 45.0-65.0 | | | |
| Mean±SD | 55.3±5.2 | | 56.1±5.6 | | t=1.05 | 0.31 |
| Sex: | | | | | | |
| Male | 57 | 87.7 | 42 | 68.9 | | |
| Female | 8 | 12.3 | 19 | 31.1 | 6.63 | 0.01* |
| Residence: | | | | | | |
| Urban | 29 | 44.6 | 31 | 50.8 | | |
| Rural/camp | 36 | 55.4 | 30 | 49.2 | 0.49 | 0.49 |
| Marital status: | | | | | | |
| Married | 63 | 96.9 | 50 | 82.0 | | |
| Unmarried | 2 | 3.1 | 11 | 18.0 | 7.61 | 0.006* |
| Education: | | | | | | |
| Basic | 31 | 47.7 | 27 | 44.3 | | |
| Secondary/higher | 34 | 52.3 | 34 | 55.7 | 0.15 | 0.70 |
| Job status: | | | | | | |
| Not working | 5 | 7.7 | 10 | 16.4 | | |
| Working | 60 | 92.3 | 51 | 83.6 | 2.27 | 0.13 |
| Computer abilities: | | | | | | |
| Good | 18 | 27.7 | 14 | 23.0 | | |
| Very good/excellent | 47 | 72.3 | 47 | 77.0 | 0.37 | 0.54 |

*(*) Statistically significant at p<0.05*

Patients in the two groups were also similar regarding their medical history and special habits (Table 2). Hypertension was slightly more prevalent in the study group. Both groups had similar history or previous cardiac interventions. A family history of atherosclerosis was reported by 55.4% of the patients in the study group, compared to 67.2% in the control group; the majority of the patients in the two groups were current smokers, 80.0% and 82.0%, respectively. Regarding physical activity, only less than one-third were having daily exercise at least 30 minutes 3 or more times per week.

Table 2. Medical history and special habits of patients in the study and control groups

| | Group | | | | $X^2$ Test | p-value |
|---|---|---|---|---|---|---|
| | Study (n=65) | | Control (n=61) | | | |
| | No. | % | No. | % | | |
| Past history of MI | 20 | 30.8 | 17 | 27.9 | 0.13 | 0.72 |
| Hypertension | 31 | 47.7 | 21 | 34.4 | 2.28 | 0.13 |
| Previous cardiac intervention | 62 | 95.4 | 58 | 95.1 | Fisher | 1.00 |
| Family history of atherosclerosis | 36 | 55.4 | 41 | 67.2 | 1.85 | 0.17 |
| Current smoking | 52 | 80.0 | 50 | 82.0 | 0.08 | 0.78 |
| Exercising 30+ min 3+days/week | 13 | 20.0 | 18 | 29.5 | 1.53 | 0.22 |

The comparison of the quality of life (QoL) of patients in the study and control groups (Table 3) at the pre-intervention phase revealed similar distribution with the highest domains reported in relation to

physical and social functioning and emotional role. At the other extreme, none of the patients in either group had high QoL related to vitality. The only statistically significant difference was in physical functioning, which was higher in the study group (87.7%) compared to the control group (62.3%), p=0.001. In total, 21.5% of the study group patients and 16.4% of those in the control group had high QoL. At the post-intervention phase in the study and control groups revealed two statistically significant differences. These were related to physical function (p=0.005) and bodily pain (p<0.001). In both these differences, the percentages were higher in the study group patients. Moreover, they had higher QoL related to physical role and social functioning, but the differences were only of borderline significance, p=0.06 and p=0.08, respectively. Concerning QoL at the follow-up phase, the table indicates statistically significant differences in almost all domains. The only exceptions were in the physical function, vitality, and role emotional domains. In total, 83.1% of patients in the study had high QoL, compared to 63.9% of those in the control group (p=0.01).

Table 3. Quality of life (QOL) among patients in the study and control groups throughout the intervention

| | Pre | | | Post | | | FU | | |
|---|---|---|---|---|---|---|---|---|---|
| | Study (n=65) % | Control (n=61) % | p-value | Study (n=65) % | Control (n=61) % | p-value | Study (n=65) % | Control (n=61) % | p-value |
| QOL domains: | | | | | | | | | |
| - Physical functioning | 87.7 | 62.3 | 0.001* | 95.4 | 78.7 | 0.005* | 93.8 | 83.6 | 0.07 |
| - Role physical | 20.0 | 13.1 | 0.30 | 47.7 | 31.1 | 0.06 | 73.8 | 44.3 | 0.001* |
| - Bodily pain | 16.9 | 18.0 | 0.87 | 81.5 | 31.1 | <0.001* | 98.5 | 42.6 | <0.001* |
| - General health. | 13.8 | 6.6 | 0.18 | 38.5 | 26.2 | 0.14 | 73.8 | 32.8 | <0.001* |
| - Vitality | 0.0 | 0.0 | 1.00 | 10.8 | 6.6 | 0.40 | 23.1 | 31.1 | 0.31 |
| - Social functioning | 49.2 | 32.8 | 0.06 | 86.2 | 73.8 | 0.08 | 95.4 | 80.3 | 0.01* |
| - Role emotional | 47.7 | 63.9 | 0.07 | 89.2 | 86.9 | 0.68 | 96.9 | 96.7 | 1.00 |
| - Mental health | 24.6 | 23.0 | 0.83 | 61.5 | 57.4 | 0.63 | 81.5 | 65.6 | 0.04* |
| Total QOL | 21.5 | 16.4 | 0.46 | 66.2 | 54.1 | 0.17 | 83.1 | 63.9 | 0.01* |

*(*) Statistically significant at p<0.05*

Figure 1 illustrates the changes in QoL scores throughout the study phases. It indicates increasing trends in both groups, which were statistically significant (p<0.001). However, as evident from the figure, the increases were higher among patients in the study group.

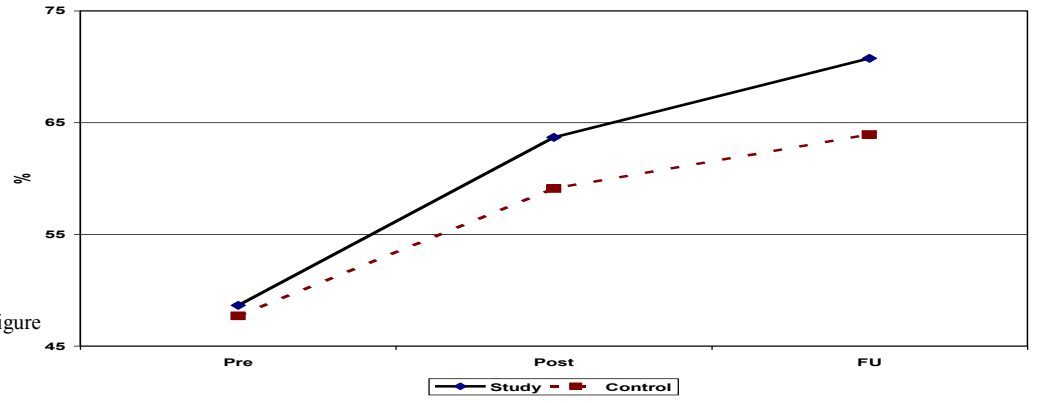


Figure 1. Changes in QoL of patients in the study and control groups throughout the study phase

## 4. Discussion

In the fast changing modern society, e-health care systems are currently the best possible way to achieve enhanced service efficiency and quality( Chang & Chang ,2008). The current study hypothesized that CHD patients exposed to the E-learning program will have more positive quality of life indices compared to coronary heart disease patients on standard management. The study findings point to significant improvements in the QOL of patients in both groups, but it was higher in the intervention group, which leads to acceptance of the study hypothesis. The two groups of patients involved in the study were similar in most of their socio-demographic characteristics. This similarity is essential to ensure that any changes obtained after the intervention would not be attributed to differences in these characteristics. Patients had also similar medical history. Therefore, their heart condition, with the related risk factors, was quite similar. Additionally, the history of smoking was alike in both groups. Therefore, smoking is considered a major risk factor in the present study samples, which should be targeted in any health education intervention as a proved modifiable risk factor in ischemic heart disease( Dalal et al., 2010) .

Furthermore, the baseline assessment of physical activity demonstrated a similarity between the two groups. In both, only a minority of the patients reported carrying out physical exercise at a level presumed to be of benefit for improving their risk factors, i.e. exercising at least 30 minutes per day, 3 or more times per week. This lack of physical activity is another proven modifiable risk factor identified at the baseline, and addressed in the educational intervention. In this regard, it has been shown that unsuccessful behavior change related to physical limitations had a negative impact on the prognosis of ischemic heart disease patients.( Peterson et al., 2010). Moreover, patients' exertional tolerance improves significantly with exercise training.( Giallauria, Galizia & Lucci, 2008).However, exercise must be maintained for long-term to sustain the improvements ( Herdy , Marcchi & Vila, 2008).

Quality of life (QoL) is an important outcome indicator in chronic diseases. It has been measured among patients in the study and control groups of the present study before implementation of the intervention. The results showed low levels of QoL in many of the domains especially those related to vitality, physical role, and general health. Meanwhile, QoL in the physical functioning domain was high in both groups, especially among the study group patients. This difference must be taken into account in the interpretation of the post-intervention QoL. The QoL findings indicate that ischemic heart disease has a more significant impact on psycho-social aspects, compared to physical aspects. Meanwhile, the high QoL in the physical functioning might be explained by that the majority of the present study patients had undergone some type of cardiac surgery or intervention. This has been shown to be associated with improvements in the QoL of such patients postoperatively ( Hunt , Hendrata & Myles, 2000).

At the post-intervention phase, few differences of significance were noticed in the comparison of patients in the study and control groups of the current study. These differences were related to systolic blood pressure, as well as QoL related to physical function and bodily pain. In all these differences, the improvements were more prominent among patients in the study group.

Assessment at the follow-up phase revealed further differences between the study and control groups of the present study. These were related to improvement of systolic blood pressure, which were significantly better among study group patients.

In agreement with these foregoing findings, a systematic review comparing home-based educational program with usual care reported a statistically significant reduction in systolic blood pressure at follow-up in the home-based group ( Jolly, Taylor, Lip & Stevens, 2006).

Overall, patients in the study group of the current study had higher QoL compared to control group patients in the follow-up phase. These improvements were observed in almost all the domains of QoL. Such improvements reflect the positive impact of e-learning on patients' lifestyles, which would

have affected the improvements in some of the physical parameters such as blood pressure. The findings are in agreement with Mårtensson et al., (2005) who demonstrated a significant improvement in the intervention-group at 3 months follow-up regarding role function due to physical limitations as well as a tendency toward improved vitality and social functioning. Similar results were reported by Dunagan et al., (2005) regarding QoL after 6 months of follow-up.

On the other hand, other studies showed no differences in QoL scores between baseline and follow-up in both the control as well as the intervention groups (Del Sincad , 2007; Balk et al., 2008) .The discrepancies among various studies regarding improvement of QoL might be related to differences in the measuring tools, as well as the types of interventions and the periods of follow-up.

An important issue to be considered in any educational or training program is the compliance to such program. In the present study, it was difficult to measure the compliance of the study group patients to the instructions and information provided to them through e-learning. This is considered a limitation of the present study that must be taken into consideration in the interpretation of its results and its implications. However, this limitation has been previously noticed in similar home-based programs. Thus, Jolly et al. (2007).emphasized that it is difficult to make a comparable measure of adherence to a home-based program as adherence to a centre-based program is usually defined by the number of sessions attended. Accepting a visit from a rehabilitation nurse at home requires less commitment from the patient and gives no measure of the amount of physical activity undertaken. Therefore, in such situations, researchers rely on patient self-report, which could be another limitation due to participants' as well as interviewer's bias (Arthur , Smith , Kodis & McKelvie, 2002).

The study findings support the hypothesis that e-learning can be an effective measure to improve the QOL of CHD patients. This approach has the advantage of being flexible in delivery and offers a variety of options compared with face-to-face groups; health professionals function mainly as facilitators in this approach.( Lindsay , Smith ,Bellaby & Baker, 2009) Moreover, on the Internet, participants can feel more comfortable talking about their condition, which may help them to develop supportive relationships ( Onnela , Saramaki & Hyvonen , 2007). The findings suggest that nurses could begin to think about presenting their educational content using multiple modalities to enhance patients' knowledge and performance of behaviours ( Fredericks , Beanlands , Spalding & Da Silva , 2010).

## 5. Conclusion and recommendations

This intervention study demonstrates that an E-learning program does have a positive effect on patients with CHD in terms of improved QOL. The success of the study confirms the value of E-Learning program information provided to patients with CHD and the significant role nurses can play in patient education, and their contributions to promoting the recovery and preventive process of CHD patients. However, interpretation of the findings must take into account the study limitation of possible contamination or co-intervention bias as some of the patients in the control group may have had access to the E-learning site or other similar sites, which led to improvements among them. Nonetheless, these bias if occurred would lead to lower differences between the two groups rather than exaggeration of the effect of the intervention.

The study recommends that cardiac units and clinics should include E-learning educational material related to CHD in Arabic language. The E-learning solution can be applied for the education of patients with related illnesses like Post CABG, bronchial asthma, diabetes, etc. Meanwhile, patient’s satisfaction with the proposed program was not addressed in this study; this issue warrants future study for improvement of the program.

**References**

Abdulle, A.M., Nagelkerke N.J.D., Abouchacra S., & Obineche E.N. (2008). A Potential Benefits of Controlling Coronary Heart Disease Risk Factors in the United Arab Emirates. *Kidney & Blood Pressure Research*,31(3):185-8

Arthur, H., Smith, K.., Kodis, J., & McKelvie, R. (2002). A controlled trial of hospital versus home-based exercise following coronary by-pass. *Med Sci Sports Exerc,* 34:1544–50.

Assmann, G., Cullen, P., & Schulte, H. (2002). Simple scoring scheme for calculating the risk of acute coronary events based on the 10-year follow-up of the Prospective Cardiovascular Münster (PROCAM) study. *Circulation*, 105: 310–315.

Balk, A.H., Davidse, W., Dommelen, P., Klaassen, E., Caliskan, K., & van der Burgh, P. (2008). Tele-guidance of chronic heart failure patients enhances knowledge about the disease. A multi-centre, randomised controlled study. *Eur J Heart,* 10: 1136–1142.

Britt, P. (2004). E-learning on the rise. *E-Content*, 27(11): 36-40.

Chang H.H., and Chang C.S. (2008*)*. An assessment of technology-based service encounters & network security on the e-health care systems of medical centers in Taiwan. *BMC Health Serv Res.,*8: 87.

Coster, S., and Norman, I. (2009). Cochrane reviews of educational and self-management interventions to guide nursing practice: a review, *International Journal of Nursing Studies,* 46: 508–528.

Dalal, H.M., Zawada, A., Jolly, K., Moxham, T., & Taylor, R.S. (2010*)*. Home based versus centre based cardiac rehabilitation: Cochrane systematic review and meta-analysis. *BMJ*, 340: b5631.

Del Sincado, D., Pulignano, G., Minardi, G., Apostoli, A., Guerrieri, L., & Rotoloni, M. (2007). Two-year outcome of a prospective, controlled study of a disease management programme for elderly patients with heart failure. *J Cardiovasc Med (Hagerstown),* 8: 324–329.

Ditewiga, J.B., Bloka, H., Haversa, J., & van Veenendaal, H. (2010).Effectiveness of self-management interventions on mortality, hospital readmissions, chronic heart failure hospitalization rate and quality of life in patients with chronic heart failure: A systematic review. P*atient Education and Counseling*, 78(3): 297-315.

Dougherty, C.M. (1998). Comparison of three quality of life instruments in stable angina pectoris:Angina Questionnair,short Form Health Survay( SF-36), and quality of life index-cardiac version III. *J Clin Epidemiol,*51(7): 569-75.

Dunagan, W.C., Littenberg, B., Ewald, G.A., Jones, C.A., Emery, V.B., & Waterman, B.M. (2005).Randomized trial of a nurse-administered, telephone-based disease management program for patients with heart failure. *J Card,* 11: 358–365.

Failde, Ramos, & Fernandez-Palacin .(2000).Validity and reliability of the SF-36 Health Survay Questionnair in patients with coronary artery disease. *J Clin Epidemiol,*53:359-65.

Farahani, M.A. (2008). Cultural barriers in the education of cardiovascular disease patients in Iran. *International Nursing Review,*55: 360–366.

Fredericks, S., Beanlands, H., Spalding, K., & Da Silva, M. (2010). Effects of the characteristics of teaching on the outcomes of heart failure patient education interventions: A systematic review. *European Journal of Cardiovascular Nursing,* 9(1): 30-37.

Giallauria, F., Galizia, G., & Lucci, R. ( 2008). Favourable effects of exercise-based cardiac rehabilitation after acute myocardial infarction on left atrial remodeling. *Int J Cardiol.*

Herdy, A.H., Marcchi, P.L.,& Vila, A. (2008). Pre- and postoperative cardiopulmonary rehabilitation in hospitalized patients undergoing coronary artery bypass surgery: a randomized controlled trial. *Am J Phys Med Rehabil,* 87(9):714-9.

Hunt, J.O., Hendrata, M.V., & Myles, P.S. (2000). Quality of life 12 months after coronary artery bypass graft surgery. *Heart Lung*,29(6):401-411.

Jolly, K., Taylor, R., Lip, G., & Stevens, A. (2006). Home-based cardiac rehabilitation compared with centre-based rehabilitation and usual care: a systematic review and meta-analysis. *Int J Cardiol*,111:343–51.

Jolly, K., Taylor, R., Lip, G.Y.H., Greenfield, S., Raftery, J., & Mant, J. (2007). The Birmingham Rehabilitation Uptake Maximisation Study (BRUM). Home-based compared with hospital-based cardiac rehabilitation in a multi-ethnic population: cost-effectiveness and patient adherence. *Health Technol Assess*,11(35).

Kiebzak, (2002). Use of the SF-36 general health status survey to document health-relatted quality of life in patients with coronary artery disease: effect of disease and response to coronary artery bypass graft surgery. *Heart Lung,* 31:207-13

Lie, I., Arnesenc, H., Sandvikd, L., Hamiltone, G., & Bunch, E.H. (2010). Predictors for physical and mental health 6 months after coronary artery bypass grafting: A cohort study. *European Journal of Cardiovascular Nursing*, 9 (2010) 238–243.

Lindsay, S., Smith, S., Bellaby, P., & Baker, R. (2009). The health impact of an online heart disease support group: a comparison of moderated versus unmoderated support. *Health Educ. Res*, 24(4): 646-654.

Lloyd-Jones, D., Adams, R.J., & Brown, T.M. (2010). Heart Disease and Stroke Statistics—Update. A Report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*,121:e1-e170.

Liu, C.J. (2001). Feasibility of using Short Form 36 in Chinese population. *Academic Journal of West China University of Medical Sciences*, 32: 39-42.

MaKee G. (2009). Are there meaningful longitudinal changes in health related quality of life-SF36,in cardiac rehabilitation patients? *European Journal of Cardiovascular Nursing,* 8: 40-47.

Mårtensson, J., Strömberg, A., Dahlström, U., Karlsson, J.E., & Fridlund, B. (2005). Patients with heart failure in primary health care: effects of a nurse-led intervention on health-related quality of life and depression. *Eur J Heart,* 7: 393–403.

Muller-Nordhorn, J. (2004).Change in quality of life in the year following cardiac rehabilitation. *Qual life Res*, 13(2):399-410.

Onnela, J., Saramaki, J., & Hyvonen, J. (2007).*Structure and tie strengths in mobile communication networks*. Proc Natl Acad Sci USA; 104:7332-6.

Peterson, J.C., Allegrante, J.P., Pirraglia, P.A., Robbins, L., Lane, K.P., Boschert, K.A., & Charlson, M.E. (2010). Living with heart disease after angioplasty: A qualitative study of patients who have been successful or unsuccessful in multiple behavior change. *Heart & Lung: The Journal of Acute and Critical Care,* 39(2): 105-115.

Riley, J. (2003). The nurse as expert practitioner in globa! cariJiovasciilar risk management. *Heart,*89(l 2): pp33-pp34.

Schlesselman, J. (1982). *Case control studies: design, conduct, analysis*. Oxford Uni. Press, New York, pp 145-146.

Shephard, R., & Franklin, B. (2001). Changes in the quality of life:major goal of cardiac rehabilitation. *J Cardiopulm Rehabil*, 21(4):189-200.

Thompson, P.D., Buchner, D., Pina, I.L., Balady, G.J., Williams, M.A., & Marcus, B.H. (2003). Exercise and physical activity in the prevention and treatment of atherosclerotic cardiovascular disease: a statement from the Council on Clinical Cardiology (Subcommittee on Exercise, Rehabilitation, and Prevention) and the Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity). *Circulation,* 107: 3109–3116.

Thompson, P., & Randall, B. (2001). Can E-Learning Creativity, Innovation and Entrepreneurship? *Educational Media International,* 38 (4): 289-292.

Wheeler, K., Byrne, J., & Andrea, D. (2003). eLearning and Education for Sustainability (EFS).*International Review for Environmental Strategies,* 4(1): 95-105.

Yu, D.S.F., Thompson, D.R., & Lee, D.T.F. (2006). Disease management programmes for older people with heart failure: crucial characteristics which improve post-discharge outcomes. *Eur Heart J*, 27: 596–612.